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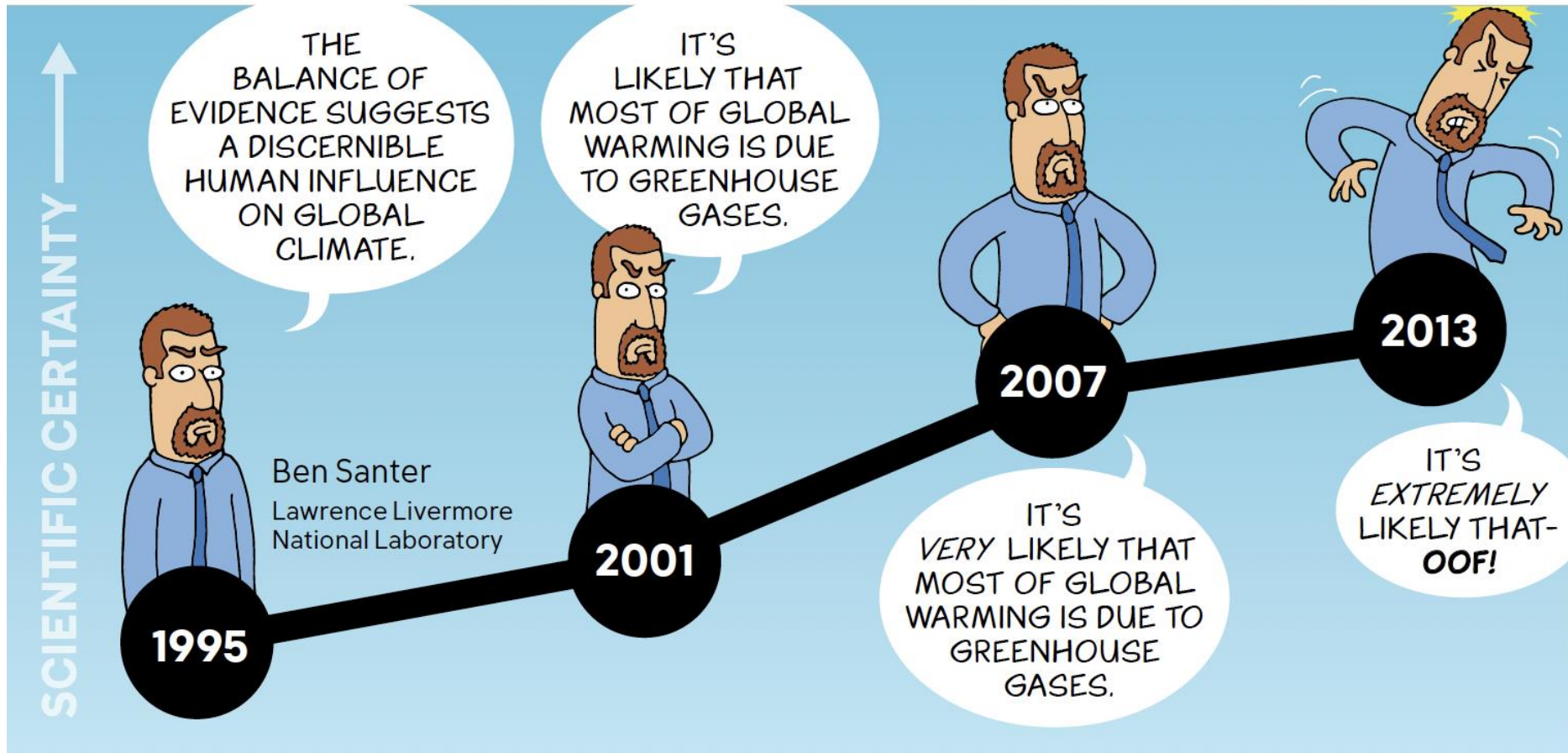
# A brief history of consensus

**Dr John Cook**

Melbourne Centre for Behaviour Change



# IPCC's strengthening consensus



## ESSAY

BEYOND THE IVORY TOWER

### The Scientific Consensus on Climate Change

Naomi Oreskes

This year's essay series highlights the benefits that scientists, science, and technology have brought to society throughout history.

Policy-makers and the media, particularly in the United States, frequently assert that climate science is highly uncertain. Some have used this as an argument against adopting strong measures to reduce greenhouse gas emissions. For example, while discussing a major U.S. Environmental Protection Agency report on the risks of climate change, then-EPA administrator Christine Whitman argued, “As [the report] went through review, there was less consensus on

Academy of Sciences report, *Climate Change Science: An Analysis of Some Key Questions*, begins: “Greenhouse gases are accumulating in Earth’s atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise” [p. 1 in (5)]. The report explicitly asks whether the IPCC assessment is a fair summary of professional scientific thinking, and answers yes: “The IPCC’s conclusion that most of the observed warming of the

Without substantial disagreement,

climate change is natural. However, none of these papers argued that point.

This analysis shows that scientists publishing in the peer-reviewed literature agree with IPCC, the National Academy of Sciences, and the public statements of their professional societies. Politicians, economists, journalists, and others may have the impression of confusion, disagreement, or discord among climate scientists, but that impression is incorrect.

The scientific consensus might, of course, be wrong. If the history of science teaches anything, it is humility, and no one

# Doran & Zimmerman, 2009

EOS

VOLUME 90 NUMBER 3 20 JANUARY 2009

## Examining the Scientific Consensus on Climate Change

Fifty-two percent of Americans think most climate scientists agree that the Earth has been warming in recent years, and 47% think climate scientists agree (i.e., that there is a scientific consensus) that human activities are a major cause of that warming, according to recent polling (see <http://www.pollingreport.com/enviro.htm>). However, attempts to quantify the scientific consensus on anthropogenic warming have met with criticism. For instance, *Oreskes* [2004] reviewed 928 abstracts from peer-reviewed research papers and found that more than 75% either explicitly or implicitly accepted the consensus view that Earth's climate is being affected by human activities. Yet *Oreskes's* approach has been criticized for overstating the level of consensus acceptance within the examined abstracts [*Peiser*, 2005] and for not capturing the full diversity of scientific opinion [*Pielke*, 2005]. A review of previous

consensus on climate change through an unbiased survey of a large and broad group of Earth scientists.

An invitation to participate in the survey was sent to 10,257 Earth scientists. The database was built from *Keane and Martinez* [2007], which lists all geosciences faculty at reporting academic institutions, along with researchers at state geologic surveys associated with local universities, and researchers at U.S. federal research facilities (e.g., U.S. Geological Survey, NASA, and NOAA (U.S. National Oceanic and Atmospheric Administration) facilities; U.S. Department of Energy national laboratories; and so forth). To maximize the response rate, the survey was designed to take less than 2 minutes to complete, and it was administered by a professional online survey site (<http://www.questionpro.com>) that allowed one-time participation by those who received the invitation.

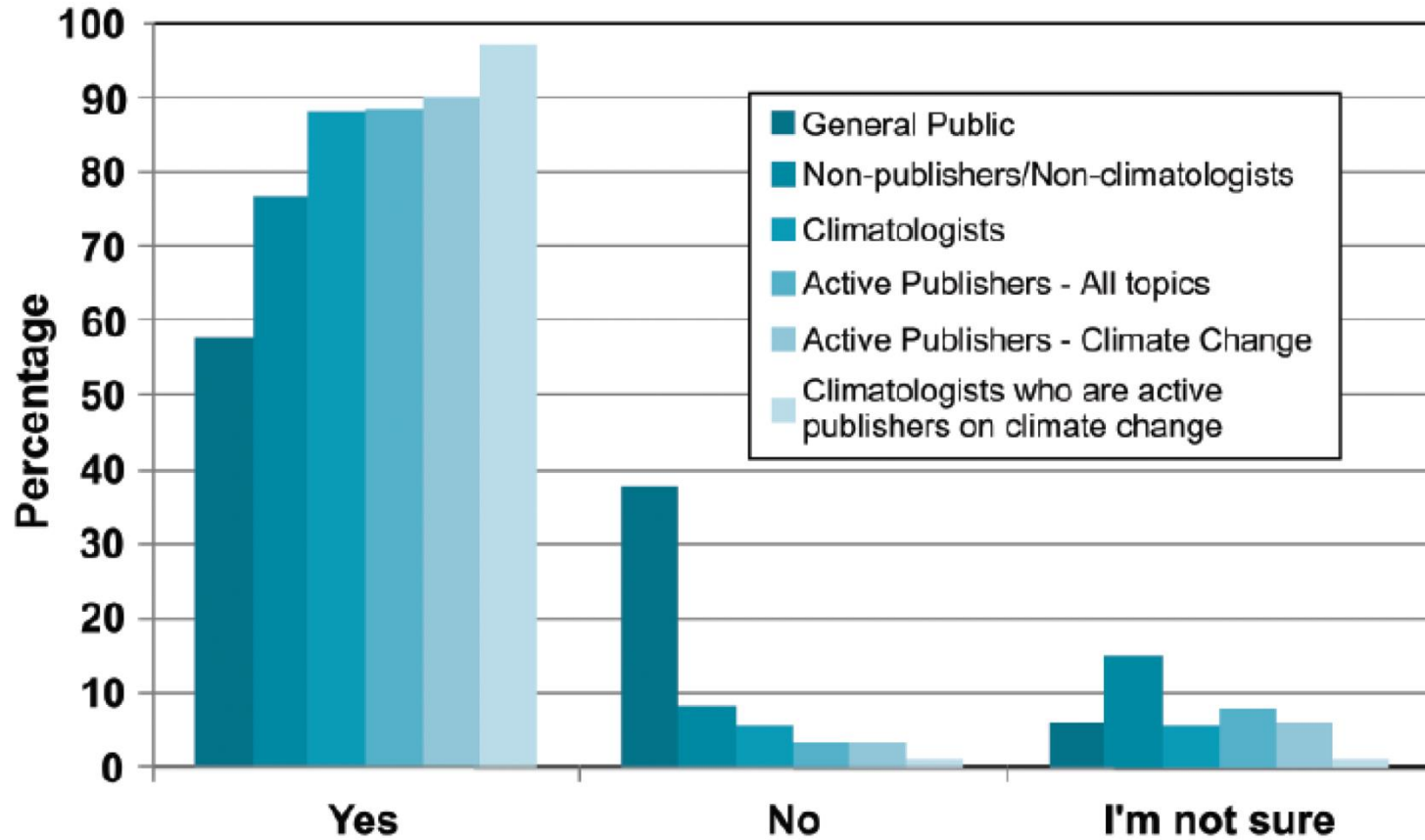
This brief report addresses the two pri-

1. When compared with pre-1800s levels, do you think that mean global temperatures have generally risen, fallen, or remained relatively constant?

2. Do you think human activity is a significant contributing factor in changing mean global temperatures?

With 3146 individuals completing the survey, the participant response rate for the survey was 30.7%. This is a typical response rate for Web-based surveys [*Cook et al.*, 2000; *Kaplowitz et al.*, 2004]. Of our survey participants, 90% were from U.S. institutions and 6% were from Canadian institutions; the remaining 4% were from institutions in 21 other nations. More than 90% of participants had Ph.D.s, and 7% had master's degrees. With survey participants asked to select a single category, the most common areas of expertise reported were geochemistry (15.5%), geophysics (12%), and oceanography (10.5%). General geology, hydrology/hydrogeology, and paleontology each accounted for 5–7% of the total respondents. Approximately 5% of the respondents were climate scientists, and 8.5% of the respondents indicated that more than 50% of their peer-reviewed publications in the past 5 years have been on the

*Do you think human activity is a significant contributing factor in changing mean global temperatures?*





# Anderegg et al., 2010

## Expert credibility in climate change

William R. L. Anderegg<sup>a,1</sup>, James W. Prall<sup>b</sup>, Jacob Harold<sup>c</sup>, and Stephen H. Schneider<sup>a,d,1</sup>

<sup>a</sup>Department of Biology, Stanford University, Stanford, CA 94305; <sup>b</sup>Electrical and Computer Engineering, University of Toronto, Toronto, ON, Canada M5S 3G4; <sup>c</sup>William and Flora Hewlett Foundation, Palo Alto, CA 94025; and <sup>d</sup>Woods Institute for the Environment, Stanford University, Stanford, CA 94305

Contributed by Stephen H. Schneider, April 9, 2010 (sent for review December 22, 2009)

Although preliminary estimates from published literature and expert surveys suggest striking agreement among climate scientists on the tenets of anthropogenic climate change (ACC), the American public expresses substantial doubt about both the anthropogenic cause and the level of scientific agreement underpinning ACC. A broad analysis of the climate scientist community itself, the distribution of credibility of dissenting researchers relative to agreeing researchers, and the level of agreement among top climate experts has not been conducted and would inform future ACC discussions. Here, we use an extensive dataset of 1,372 climate researchers and their publication and citation data to show that (i) 97–98% of the climate researchers most actively publishing in the field surveyed here support the tenets of ACC outlined by the Intergovernmental Panel on Climate Change, and (ii) the relative climate expertise and scientific prominence of the researchers unconvinced of ACC are substantially below that of the convinced researchers.

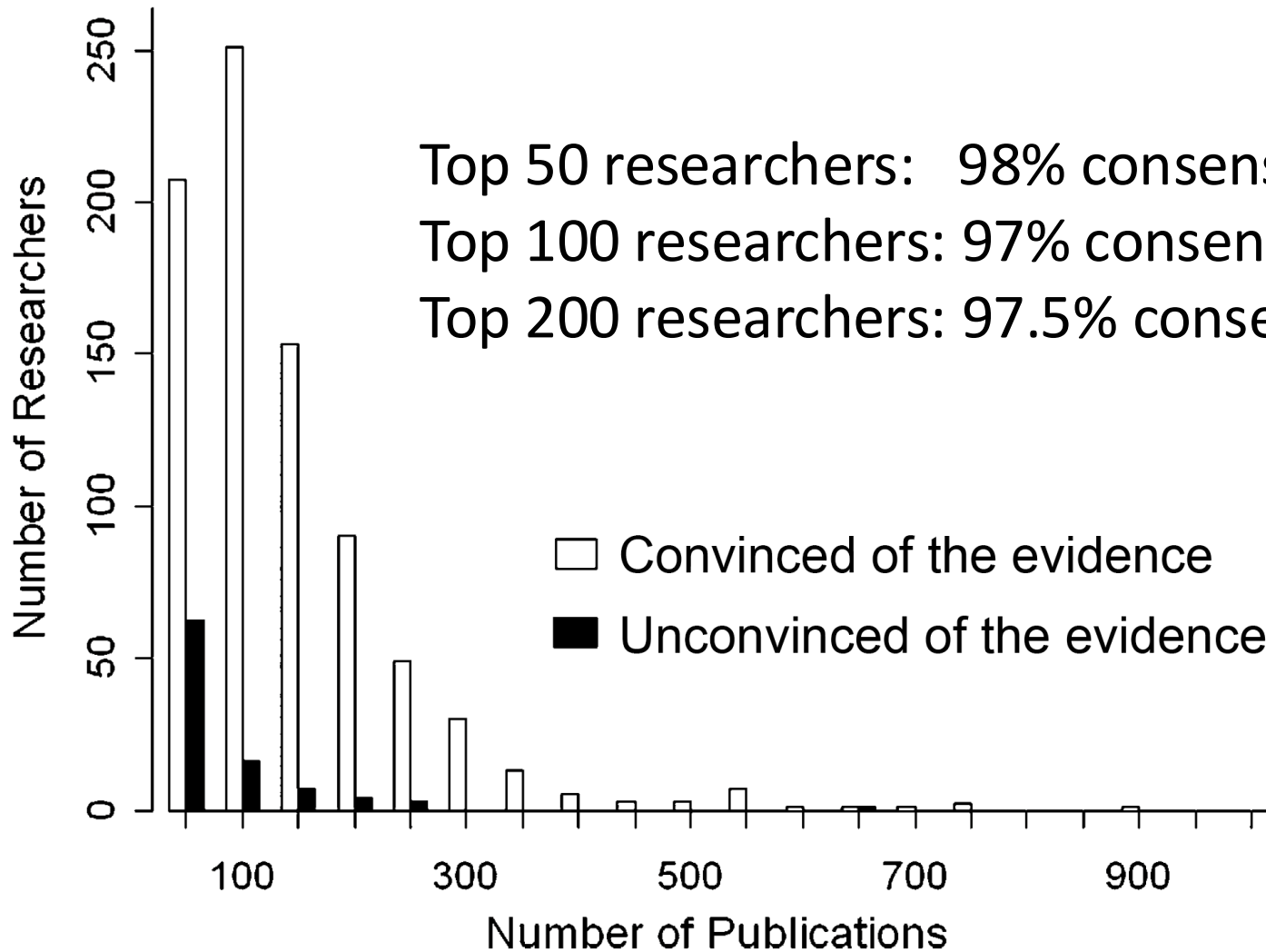
citation analyses | climate denier | expertise | publication analysis | scientific prominence

**P**reliminary reviews of scientific literature and surveys of climate scientists indicate striking agreement with the primary conclusions of the Intergovernmental Panel on Climate Change

climate change skeptics and contrarians in that we primarily focus on researchers that have published extensively in the climate field, although we consider all skeptics/contrarians that have signed prominent statements concerning ACC (6–8). Such expert analysis can illuminate public and policy discussions about ACC and the extent of consensus in the expert scientific community.

We compiled a database of 1,372 climate researchers based on authorship of scientific assessment reports and membership on multisignatory statements about ACC (*SI Materials and Methods*). We tallied the number of climate-relevant publications authored or coauthored by each researcher (defined here as *expertise*) and counted the number of citations for each of the researcher's four highest-cited papers (defined here as *prominence*) using Google Scholar. We then imposed an a priori criterion that a researcher must have authored a minimum of 20 climate publications to be considered a climate researcher, thus reducing the database to 908 researchers. Varying this minimum publication cutoff did not materially alter results (*Materials and Methods*).

We ranked researchers based on the total number of climate publications authored. Though our compiled researcher list is not comprehensive nor designed to be representative of the entire climate science community, we have drawn researchers from the most high-profile reports and public statements about ACC. Therefore, we have likely compiled the strongest and most credentialed re-



# Quantifying the consensus on anthropogenic global warming in the scientific literature

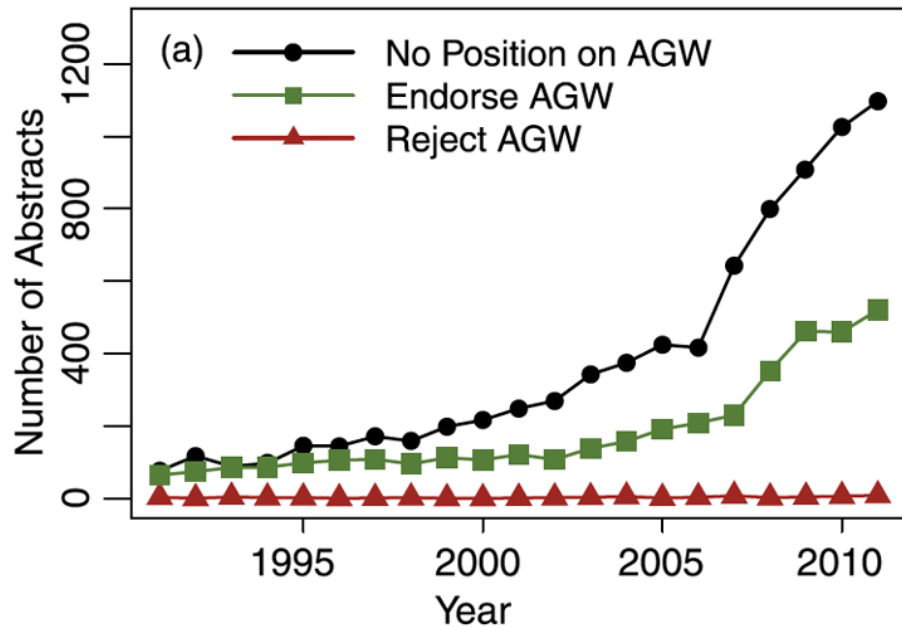
John Cook<sup>1,2,3</sup>, Dana Nuccitelli<sup>2,4</sup>, Sarah A Green<sup>5</sup>, Mark Richardson<sup>6</sup>, Bärbel Winkler<sup>2</sup>, Rob Painting<sup>2</sup>, Robert Way<sup>7</sup>, Peter Jacobs<sup>8</sup> and Andrew Skuce<sup>2,9</sup>

## Abstract

We analyze the evolution of the scientific consensus on anthropogenic global warming (AGW) in the peer-reviewed scientific literature, examining 11 944 climate abstracts from 1991–2011 matching the topics ‘global climate change’ or ‘global warming’. We find that 66.4% of abstracts expressed no position on AGW, 32.6% endorsed AGW, 0.7% rejected AGW and 0.3% were uncertain about the cause of global warming. Among abstracts expressing a position on AGW, 97.1% endorsed the consensus position that humans are causing global warming. In a second phase of this study, we invited authors to rate their own papers. Compared to abstract ratings, a smaller percentage of self-rated papers expressed no position on AGW (35.5%). Among self-rated papers expressing a position on AGW, 97.2% endorsed the consensus. For both abstract ratings and authors’ self-ratings, the percentage of endorsements among papers expressing a position on AGW marginally increased over time. Our analysis indicates that the number of papers rejecting the consensus on AGW is a vanishingly small proportion of the published research.

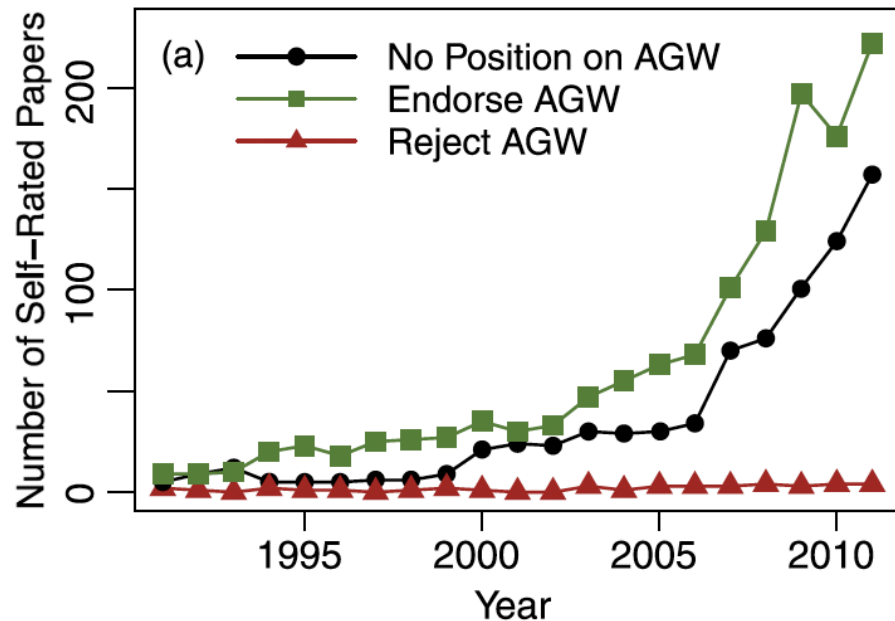


## Abstract rating

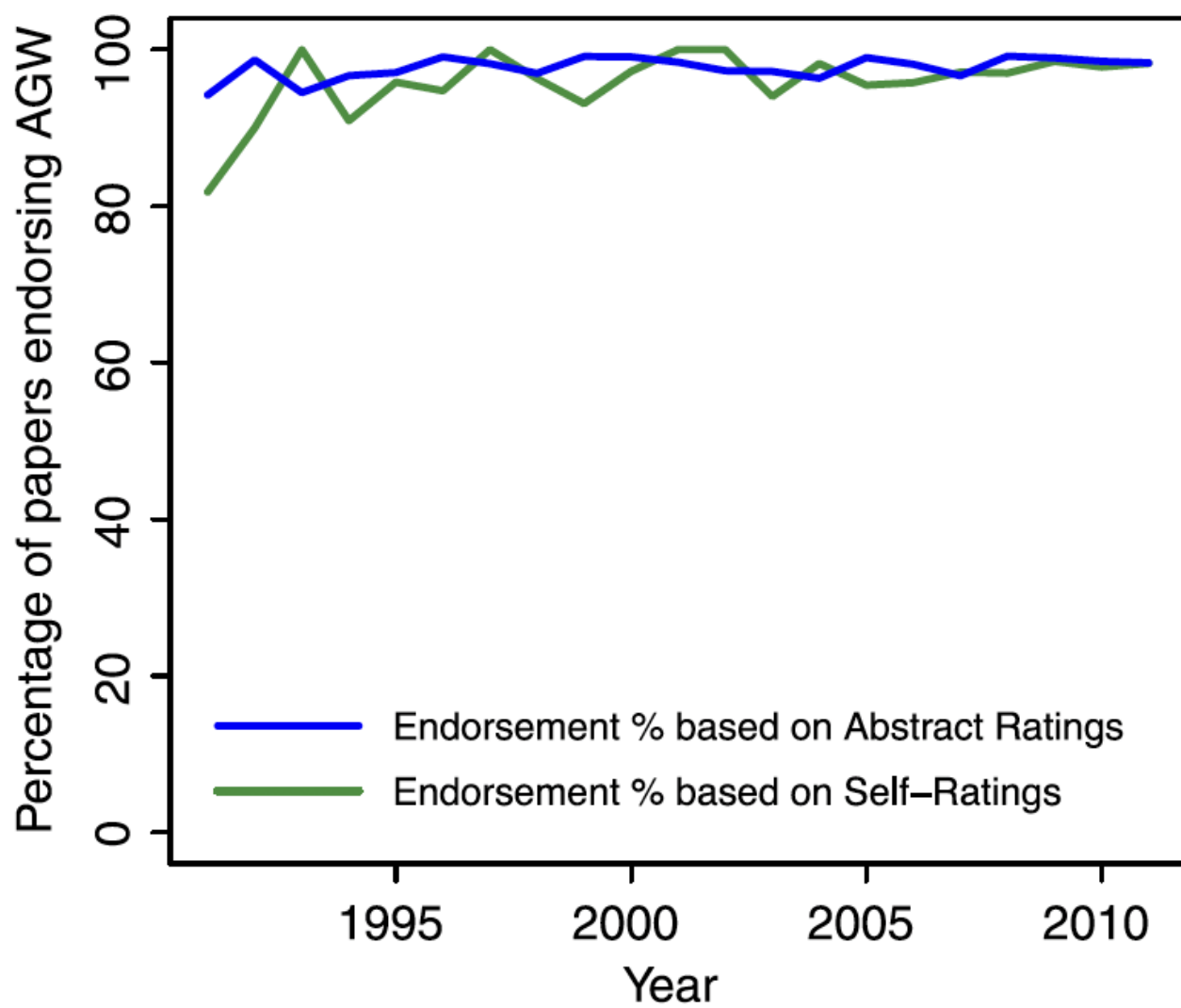


97.1% consensus

## Self-rating



97.2% consensus





**Barack Obama** ✓



@BarackObama

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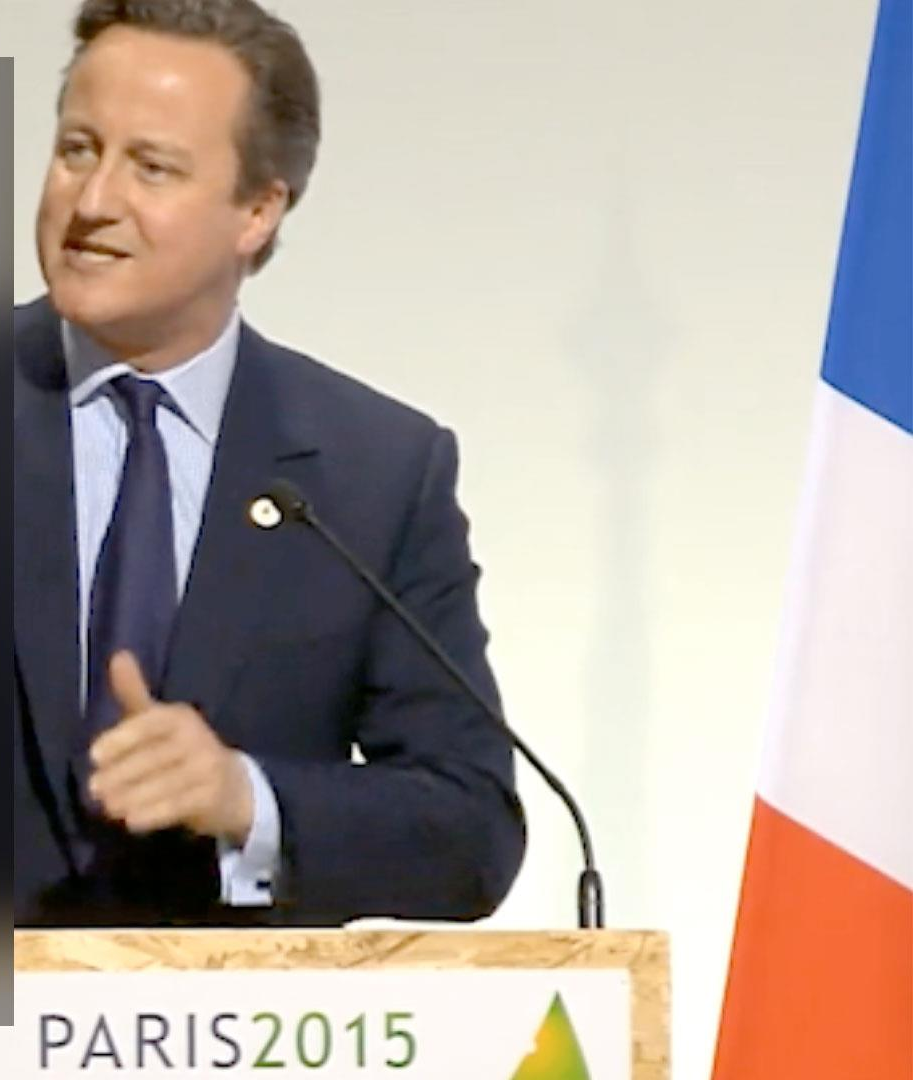


Ninety-seven percent of scientists agree: [#climate](#) change is real, man-made and dangerous. Read more: [OFA.BO/gJsdFp](#)

3:48 AM · May 17, 2013

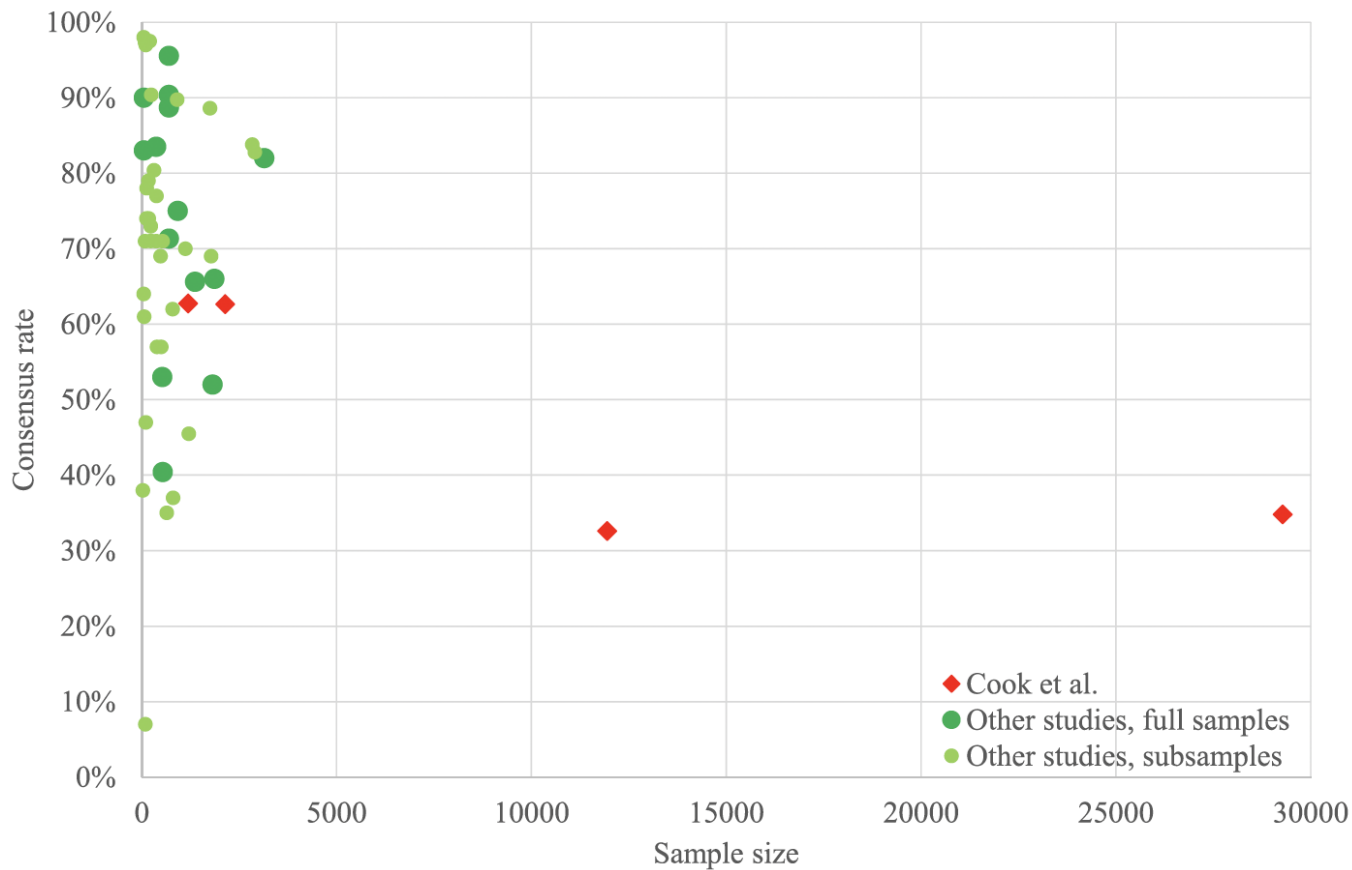
“ 97% of scientists  
the world over  
have said that  
climate change is  
urgent and man  
made and must  
be addressed. ”

PRIME MINISTER DAVID CAMERON





# Criticism (Tol, 2016)



## Environmental Research Letters



### REPLY

## Consensus on consensus: a synthesis of consensus estimates on human-caused global warming

John Cook<sup>1,2,3,16</sup>, Naomi Oreskes<sup>4</sup>, Peter T Doran<sup>5</sup>, William R L Anderegg<sup>6,7</sup>, Bart Verheggen<sup>8</sup>, Ed W Maibach<sup>9</sup>, J Stuart Carlton<sup>10</sup>, Stephan Lewandowsky<sup>11,2</sup>, Andrew G Skuce<sup>12,3</sup>, Sarah A Green<sup>13</sup>, Dana Nuccitelli<sup>3</sup>, Peter Jacobs<sup>9</sup>, Mark Richardson<sup>14</sup>, Bärbel Winkler<sup>3</sup>, Rob Painting<sup>3</sup> and Ken Rice<sup>15</sup>

### Abstract

The consensus that humans are causing recent global warming is shared by 90%–100% of publishing climate scientists according to six independent studies by co-authors of this paper. Those results are consistent with the 97% consensus reported by Cook *et al* (*Environ. Res. Lett.* **8** 024024) based on 11 944 abstracts of research papers, of which 4014 took a position on the cause of recent global warming. A survey of authors of those papers ( $N = 2412$  papers) also supported a 97% consensus. Tol (2016 *Environ. Res. Lett.* **11** 048001) comes to a different conclusion using results from surveys of non-experts such as economic geologists and a self-selected group of those who reject the consensus. We demonstrate that this outcome is not unexpected because the level of consensus correlates with expertise in climate science. At one point, Tol also reduces the apparent consensus by assuming that

### OPEN ACCESS

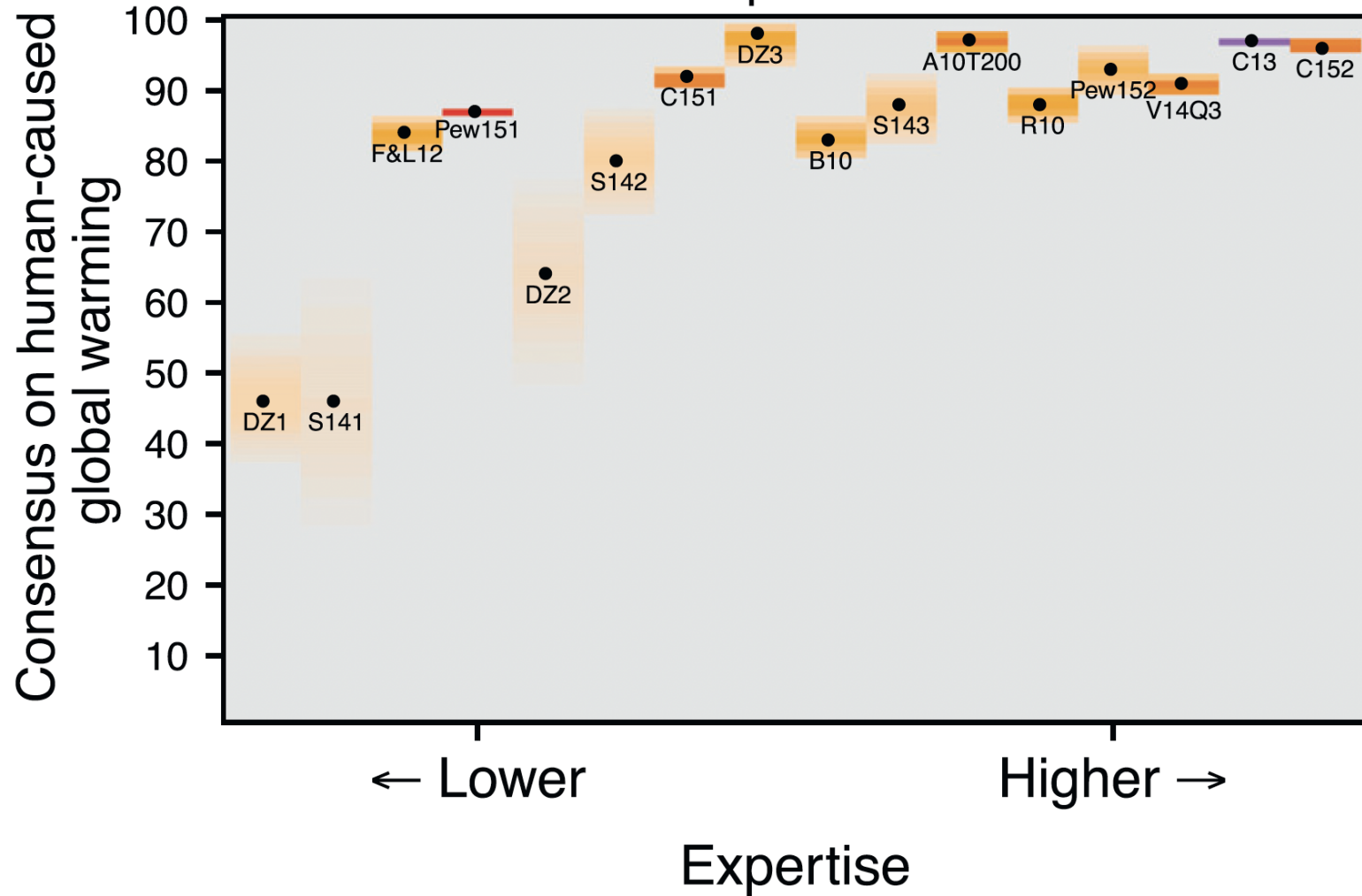
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# Consensus versus Expertise in Climate Science



## ENVIRONMENTAL RESEARCH LETTERS



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### LETTER

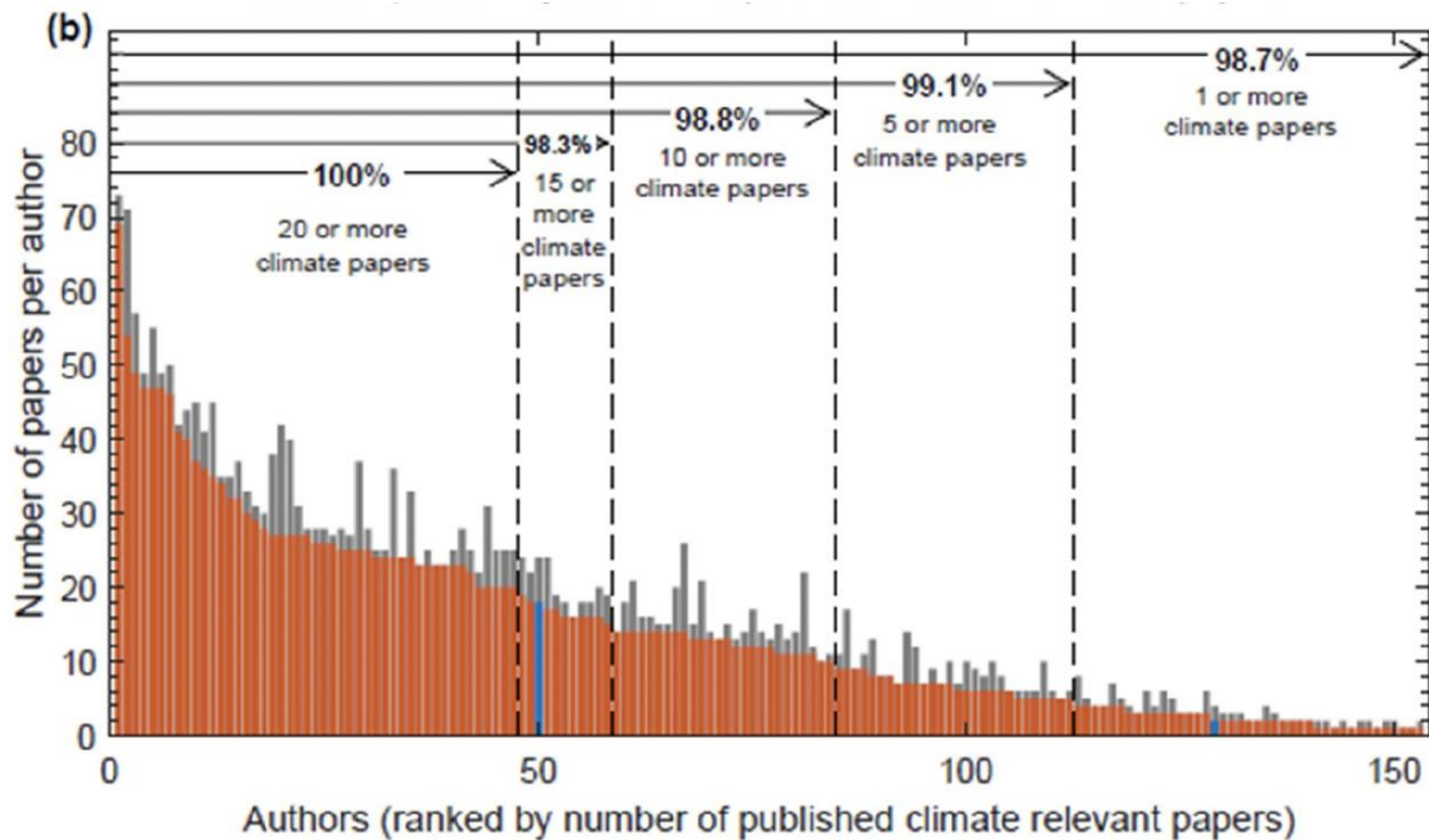
## Consensus revisited: quantifying scientific agreement on climate change and climate expertise among Earth scientists 10 years later

Krista F Myers<sup>1</sup> , Peter T Doran<sup>1,\*</sup> , John Cook<sup>2,3</sup> , John E Kotcher<sup>3</sup> and Teresa A Myers<sup>3</sup>

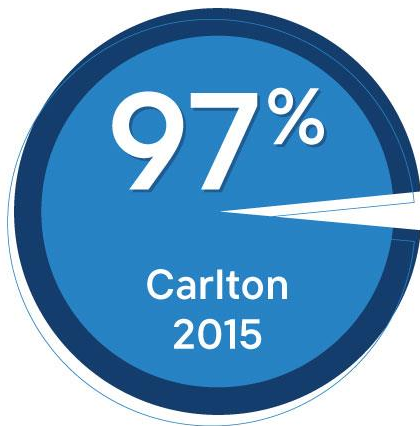
### Abstract

The scientific consensus on human-caused global warming has been a topic of intense interest in recent decades. This is in part due to the important role of public perception of expert consensus, which has downstream impacts on public opinion and support for mitigation policies. Numerous studies, using diverse methodologies and measures of climate expertise, have quantified the scientific consensus, finding between 90% and 100% agreement on human-caused global warming with multiple studies converging on 97% agreement. This study revisits the consensus among geoscientists ten years after an initial survey of experts, while exploring different ways to define expertise and the level of agreement among these groups. We sent 10 929 invitations to participate

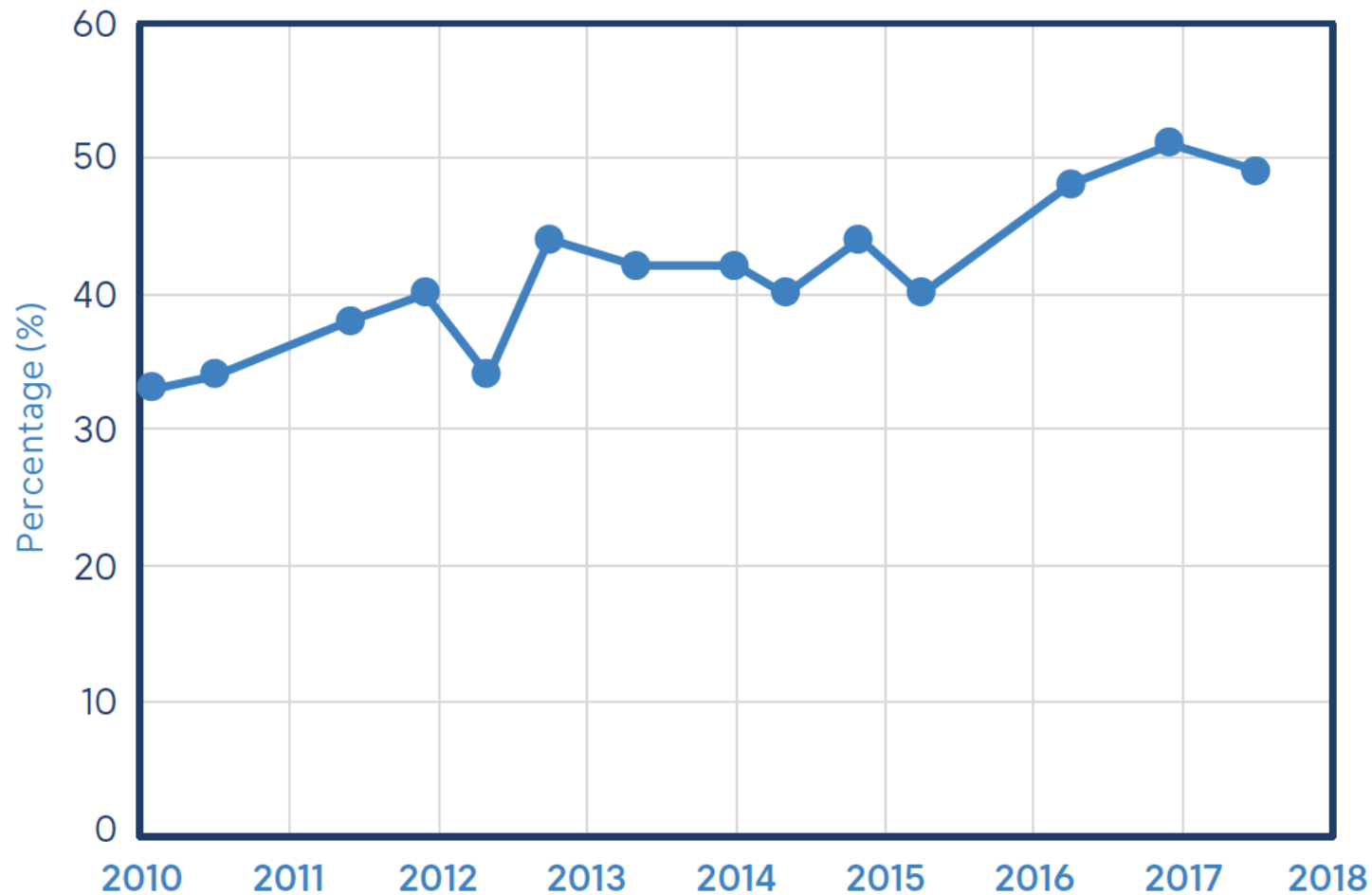




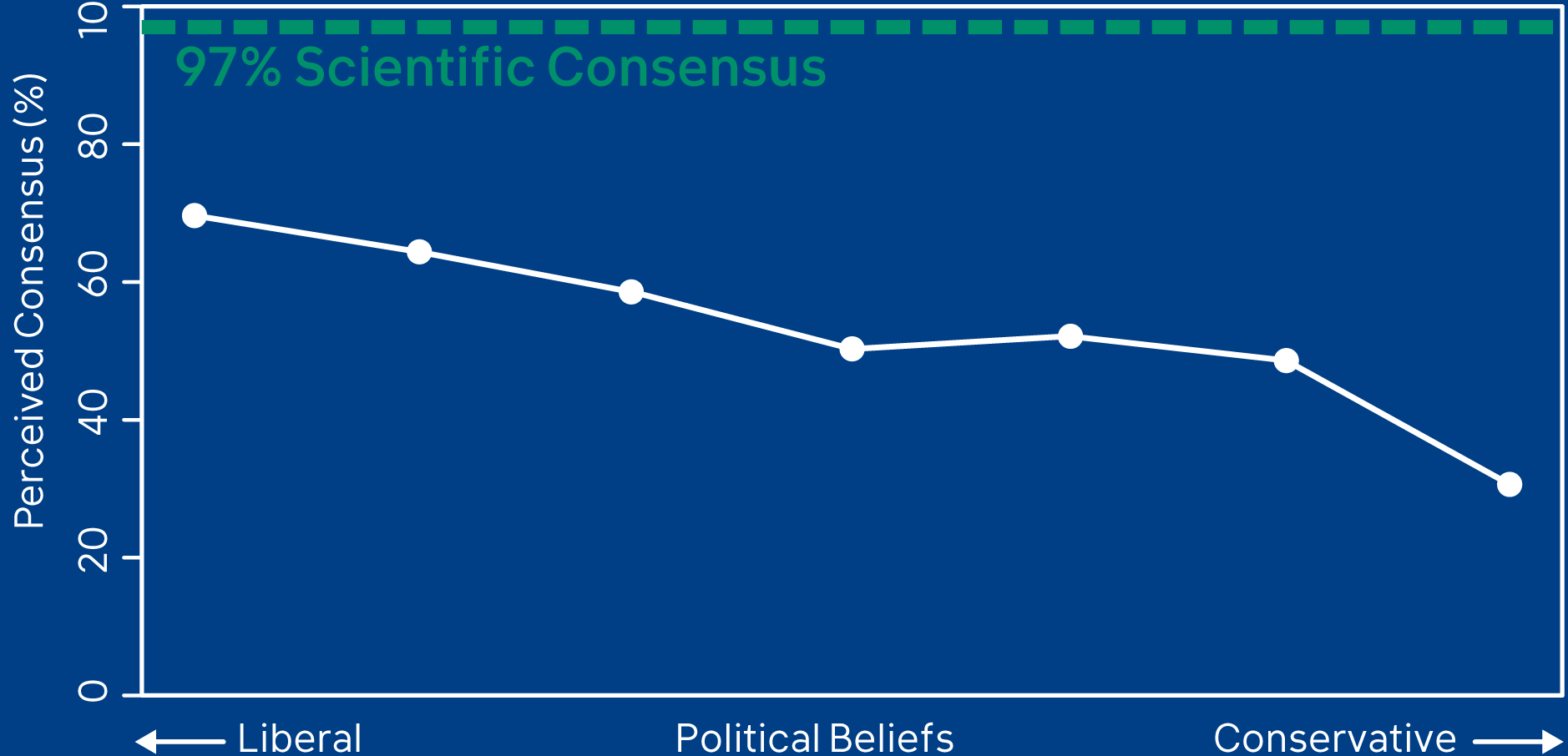
# Studies quantifying expert consensus on climate change



## Perception that most scientists agree global warming is happening

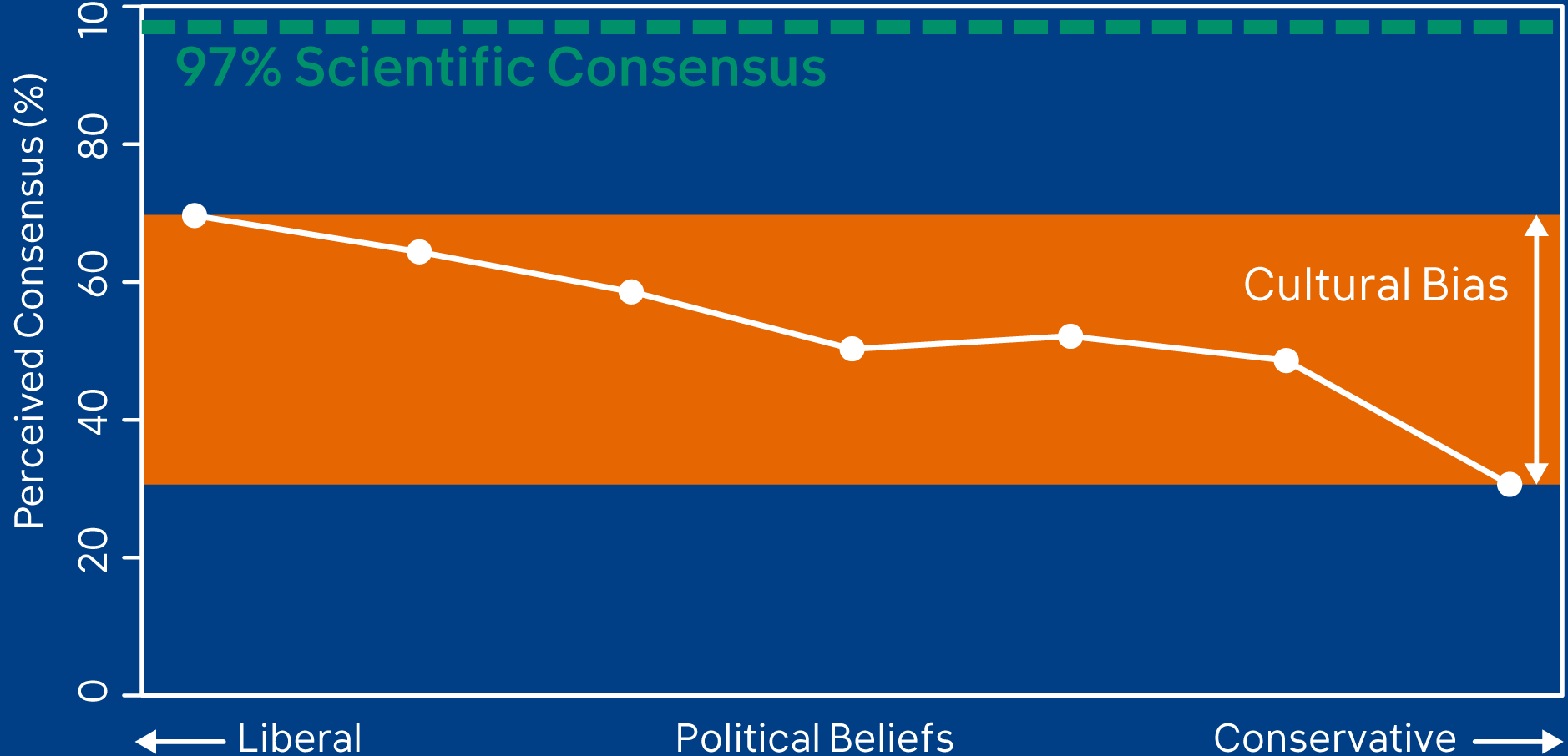


# Public perception of scientific consensus on climate change

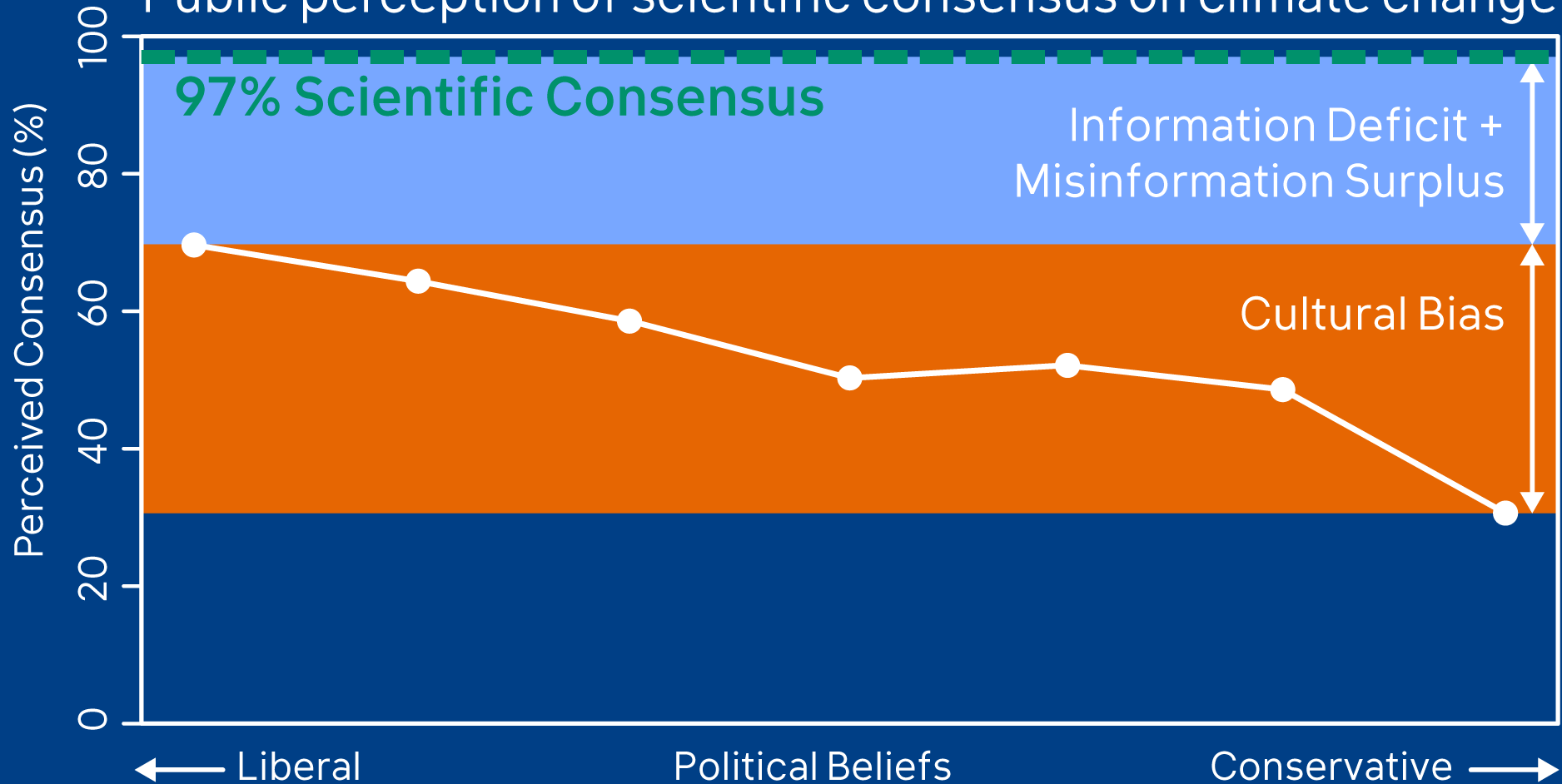




# Public perception of scientific consensus on climate change



# Public perception of scientific consensus on climate change



# WEBINAR

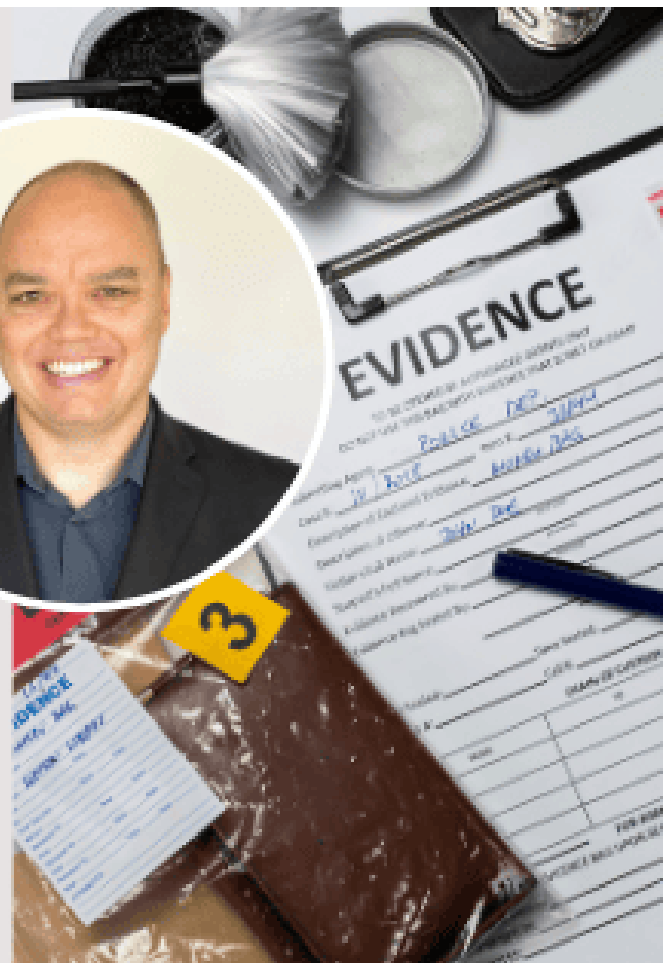
## BUST or TRUST? The scientific consensus on climate change

**Part 1 February 20 | 6pm ET**

**Part 2 February 27 | 6pm ET**

**John Cook** is a Senior Research Fellow with the Melbourne Centre for Behaviour Change at the University of Melbourne. He researches using critical thinking, psychology, gamification, and AI to counter misinformation about climate change.

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Oreskes (2004)           <http://sks.to/oreskes2004>

Doran et al. (2009)      <http://sks.to/doran2009>

Anderegg et al. (2010) <http://sks.to/anderegg2010>

Cook et al. (2013)       <http://sks.to/cook2013>

Tol (2016)               <http://sks.to/tol2016>

Cook et al. (2016)       <http://sks.to/cook2016>

Myers et al. (2021)      <http://sks.to/myers2021>

